Editing systems: On-line editing

Moderator: R. Boyd

On-line visual correction & makeup systems—
(1) Hardware: C. I. Cowan.

Mr Wiseman: Three questions for Mr Cowan, please: You mentioned that the flash that you would get from a mixed phosphor may put the flicker back in an unacceptable region, if you were using a slow repetition rate, and that it would not be possible to filter this out because you had in fact to use a light pen. You could use sunglasses which contained the filter, and then the light pen could see the flash and you could not, so that the problem could be avoided.

Next, I believe that when you are editing fairly general text you occasionally have to go back, particularly when you introduce a correction, through several pages. On your machine it is a laborious business to go back because your store does not contain that much historical data. So you might need a lot more store than you think.

Third, I cannot see any reason why you should not do all the editing with the light pen. You said that you could not because the keyboard, for certain things, is more natural. I think the proofreader is doing the natural thing when he puts little marks on the paper, and what the man carrying out the corrections should be doing is putting little marks on the screen, in much the same way.

Mr Cowan: I accept this without much argument. I do mention in my paper that one can use filters. It is not reasonable for the operator to wear sunglasses. You can reduce the flash and if you use the right kind of filter it will disappear.

The second point was editing. This is an area of compromise; clearly if you have a sufficiently large store on the computer, or if you have some disc backing store, you can have access to any page you like. It is clearly a matter of cost. If a disc were reasonably inexpensive this would not create a real problem. I have only assumed a page or two because I was considering a basic configuration with an 8K backing store.

Mr Wiseman: For your proposal to be economic it has to deal with a fair percentage of the things printers normally encounter.

Mr Cowan: I have not yet heard of this particular requirement but it might well be quite a serious one.

The Moderator: One thing Mr Cowan mentioned in his paper is that he is endeavouring to get to a minimum cost system, and this is very important. We are assuming we have a proof copy available for the man operating the display. It may well be that, rather than spend a lot of money on storing six pages, you could adopt some preplanning system on the proof copy so that you know you are causing alterations in subsequent or previous pages before it ever gets to the display. We have to bear in mind these display units are going to be expensive, and the man who sits at them must be presented with fairly accurate instructions about what he is to do. If we leave it to him to work it all out it is going to cost a lot of money.

Mr Wiseman: Ultimately, we should like to leave it to the program to work out, so whatever system you envisage is the minimum needed.

Mr Cowan: I am sure if disc backing stores and random access stores, became available cheaply this would be an essential part of the system.

The same kind of answer applies to the third point you raised about using the light pen for all corrections. I was inferring that it would not do the whole job because one would want to keyboard insertions, and so on. You can, of course, write the insertions in. But you must accept that it requires a much more sophisticated arrangement to read a light pen input in other than simply a pointer fashion. I should think that one could put corrections in, indicating the position, perhaps, with a light pen.

Mr Wiseman: It is certainly possible.

Mr Cowan: If this device is going to be usable by a number of different operators, and I do not think we can consider it for one only, you will need a more sophisticated character recognition system than perhaps you anticipate. I have no doubt it will come but I do not think it is an immediate prospect.

Mr Holroyd: What is the basis for saying that a display system such as Mr Cowan has described is unsuitable for proof reading and yet, apparently, is suitable for correction and makeup?

Mr Cowan: If the device is not going to be used for proof reading the character quality would probably be of a lower standard. I do not think, with the kind of characters we are getting at the moment, that proof reading would be a good thing to do. First of all, you are tying up a very expensive installation. This is not an economic way to use it. Proof reading would be difficult because we are not representing all the different fonts. Even if you use an interpretative method it might be difficult for the proofreader. It is looking quite a way into the future to envisage proof reading from CRT.

Mr Holroyd: I should have thought the fatigue factor in correction of makeup is not very far removed from the fatigue factor in proof reading.

Mr Cowan: Probably not, but in proof reading you are reading a lot, and in correction, it is perhaps 10 per cent in a half million word novel.

The Moderator: I should say about three corrections in a hundred lines.

Mr Cowan: The point is, you are having to read far less. You are doing positive work. Proof reading is a passive business for 90 per cent of the time. It is a very inefficient way of using the machine. I am not saying it would be useless, but the proposed system allows us to represent the text with low-grade characters.

Mr Holroyd: I am not so concerned about the possibility of using the machine for proof reading as your approach to the fatigue factor. This would mean debasing the standard of presentation merely because it is correction of makeup as opposed to the standard you may envisage for proof reading. I do not agree with this, because, if you are going to have a high order of accuracy and output on a scope editing system (with presumably the traditional compositor sitting at the keyboard), then you require a high order of graphic design to avoid the fatigue factor.

Mr Cowan: I should have thought the fatigue factor would be greater where you have to understand the text compared with correcting it. Having to understand the text requires better presentation, I should have thought.

Mr Baconnet: How about the position of the light pen if your hand shakes? I was thinking of the 1,000 by 1,000 grid. If your hand shakes you will get on the wrong co-ordinates.

Mr Cowan: One can use a marker on the screen to indicate where one is pointing a light pen, so there is a kind of feedback to the operator to tell him the actual position.

Mr Baconnet: I always thought that some device similar to a drafting table, whereby you can accurately position your pen, might be desirable.

Mr Newman: You can scale down the movement of your hand.

Mr Cowan: I do not want to get on to design automation, but in text editing you are dealing with large areas and it is not difficult to indicate a character.

Mr Girod: What is the speed of the character generation on that screen? What is the memory system? Does it memorise point by point, or is there some sort of optical memory which gives the configuration of the character to the final display?

Mr Cowan: No, the character is generated in a vector manner.

Mr Baconnet: Are we going to hear about any practical installation using these visual displays for editing?

The Moderator: We are going to hear about some practical work being done on editing but not in printing.

Mr Baconnet: It is obvious that the cost is beyond the reach of the average printing business. I am being very careful because I know there are some very large firms, but the price seems to be quite high.

The Moderator: I can only say that our own experience is that we went to visit Neil Wiseman at Cambridge, who has a PDP-7, about which he will be talking later on, and we faked up some pages of text; it was a James Bond book, in fact. We took an operator over with us. One section in particular had 15 errors. They were wrong on the screen and we had the proof already marked with the corrections. He corrected those 15 words without any trouble at all in 90 seconds using a combination of light pen and keyboard. From this we deduced that, provided you gave the operator a proof on which you had marked instructions as to headlines and folios and, assuming two corrections per page, a page can be processed per minute. I suggest this starts to make economic sense.

Mr Cowan: The kind of system cost which we are considering, using a small central processor and 17-inch display, would be about £30,000 to £35,000. If this has a simultaneous off-line justification and hyphenation channel, which seems reasonable, it might be shown to be an economically worthwhile proposition.

On-line visual correction & makeup systems—
(2) Software: P. M. H. Tobias.

Mr Wiseman: Mr Tobias said the use of the computer core to drive the display might be prohibitive in terms of lost computer time. I did a quick sum when he said that and I make it five per cent for a good average computer and a good average display. Is that prohibitive?

Mr Tobias: I am surprised it is as little as that but I accept your point.

Mr Cowan: In a way, supplying a refresh buffer is adding an ADT facility to the system. We are talking about a minimal system which does not have ADT facilities.

Mr Wiseman: This bit of core is a useful thing to do computing in and I would have thought, in a minimal system, it would make more sense to put it in a computer.

Mr Tobias: You cannot do both; if you have got your text you cannot use it as work space.

Mr Wiseman: My editor computes in the text buffer.

Mr Tobias: Well, this is your spare insertion space.

Mr Girod: If we are thinking of book production you say the program takes care of the short line. But with a short chapter, in good quality bookwork, you have to finish a chapter on the left

page and begin a chapter on the right page, so some correction of makeup has to be done when you know the fall of the last line of the chapter. In that case, if you have an on-line editing system of correction, you get the page before the end of the chapter and you do not know if you have to correct it or not.

Mr Tobias: You are saying that when you get to the end of the chapter you may find you have to squeeze on to previous pages?

Mr Girod: Or change something.

The Moderator: I am quite convinced we must have a proof and we must forecast the decisions like this on the proof. This is nothing new to us. Printers already do this for hot metal. They go through the proof and forecast exactly where the chapter is going to end and when making the author's corrections their length is forecast, as are the house corrections, in order to bring the end of the chapter or the end of the paragraph into the right position. In other words, I think a degree of planning on the proof must be associated with this display.

Mr Girod: Yes. What is possible for on-line display and what is possible on the proof itself has to be defined very carefully. I think this is very important for footnotes, for the short line at the end of the page, for the title, and so on, and if we want to do a quality job in accordance with the typographical rules we have to consider the limit of the on-line display system, because it could damage the typographical tradition if we considered it as a perfect system for correction.

Mr Phillips: When I am an author I write the copy to fill the space that is left on the proof. You should persuade authors to do this if possible.

Cathode ray digital information display systems as a man-made interface: I. A. Jones & C. K. Street

The Moderator: Have you considered adapting this machine as an off-line punched tape producing device?

Mr Jones: No. The applications we have had for this machine so far have almost invariably involved the use of a central processor.

Mr Girod: Do you use a special key to produce capitals?

Mr Jones: No, the operation is the same as a typewriter. If you want a capital you press the shift key and depress the character key simultaneously, in the same way as a typewriter. With the function keys and a computer it should be possible to change series of characters not only from capital to lower case but from roman to italic.

Mr Girod: Have you roman and italics displayed on the monoscope?

Mr Jones: You could, but it is not necessary for typescript preparation to have the display in the same font you would actually use.

Mr Girod: Indication must be given of what has to be in italics.

Mr Jones: In order to display a greater range of characters you would need a much larger font source than one tube, but it is quite feasible. In fact, I have suggested in the paper that you could have a number of monoscopes and bring up the right character, on a single page display, in the right font and deal with a large number of fonts.

Mr Girod: What is your multi-font system?

Mr Jones: This would either identify the section you wanted to appear in another font or be effected by a function key. It is quite feasible to allocate function keys to fonts so that you can produce a particular font.

Mr Girod: If you do typesetting with that terminal you will need special hyphenation for a special word, for example, for a foreign word. Do you have a series of function keys so that if a certain word is broken it has to be broken at a certain place? Have you extended the function keys to include hyphenation and word spaces?

Mr Jones: One way in which it could be done would be by bringing the text up in the unhyphenated case, where there is some doubt as to where a hyphen should be. The cursor, which is movable, can be placed where you would expect the hyphen to be. Then the material can be passed back to the computer and the cursor will identify where the hyphen should appear. This is one way we have done it.

Mr Girod: With regard to text editing, can you do makeup with indention right, indention left and so on?

Mr Jones: Yes.

Mr Holroyd: Are you able to express the term 'jitter' in terms of perceptibility? You said that jitter should be non-perceptible. Can you express this in numerical terms?

Mr Jones: A number of operators have been specifically allocated the task of looking for jitter and have not been able to find any. This is a function of the timing errors which accrue in the circuits.

Mr Baconnet: I have been thinking about photo typesetting equipment which uses cathode ray tube displays. This is highly sophisticated and expensive equipment, and if someone decides that he is going to use this type of equipment why could he not use it as a side display for the operator to see the actual typographical characters displayed on the screen before going into film in another part of the unit? This relates to one type of photo typesetting equipment, but this is already capable of generating high quality typographical characters in their final form. Not at sufficient speed yet. But the same device which does the final composing on film could also give you the characters on display. We are not looking for quality—we know the final quality will be high-definition character—but proofing quality.

Mr Cowan: I think it is a matter of speed. You can probably generate characters to fairly good quality up to 5,000 a second, but I do not know whether you could get the 50,000 a second which seems to be indicated at the moment.

Dr Margerison: If you are going to continue to see it on the screen, you either have to have a very expensive form of tube which will take the signal and statistise it on the face of the tube, or else you have to keep returning to your character generator to regenerate the characters. As these character generators are inevitably rather expensive because they have all these typographic figures on them, the thing becomes uneconomic. It would be much better to put a sheet of paper through and get a quick print off it.

I am a commercial man and am therefore very concerned with prices, but there is a place for the type of screen that Mr Cowan is talking about which is relatively cheap and which gives you a check on whether or not the codes contained in your system, and which will eventually go to the photo typesetting equipment, are the correct ones. Therefore you put all your function codes on to the screen, and for 'change lens' you see a sign which represents that particular code. The advantage is that, if you are going to do photo typesetting, it has got to be right when it reaches the photo typesetter, otherwise corrections are high and this is costly and difficult. This is a method of checking on codes. Would you agree with that?

Mr Cowan: Yes. We have thought about just putting a symbol which means 'there is a change here'. If the operator wants to find out what the change is he can interrogate that symbol by marking it in a conventional way and, in some other area, a more expanded version of that change can appear.

Mr Girod: I think perhaps the makeup screen should be used for newspaper work. You have already included in the computer a program for makeup, and you want to see what it looks like. It is a problem of appearance. For me, the uses of a display for correction can be of three sorts: first, a typographical correction with correction of text, punctuation and so on. I have myself been trying the introduction and input of mathematical formulae for input in a typesetting routine. The second use is auto-correction. I do not believe the display can be used for auto-correction when you want to take out a paragraph and change the makeup and so on. The third use is for correction of makeup where you already have a book in the memory and you want to change the justification, character and so on; I do not think it is suitable for that. I think it should be reserved for the correction of typography when it is sufficiently sophisticated for mathematical formulae.

Mr Cowan: I should certainly agree with that.

Character generation display & manipulation on CRT: T. W. Pegram & B. Robinson

The Moderator: I am very concerned about the fatigue element of holding a light pen, a point which someone has already raised. After all, we are concerned with working about seven hours a day and fairly continuous operation. Have you any information on the fatigue aspect?

Mr Pegram: No. This is one of the problems on which a lot of work still has to be done. Until we have a system which can be continuously used with no modification it is impossible to measure the psychological effects. As regards using tracker balls and joysticks, these are bound to be less fatiguing because one's hand is on a desk and one's arm is supported. It is only a question of moving from the wrist and the fingers. But the trouble with these two devices is that it is a long process to get to an exact point, because you do it by trial-and-error. With a light pen you can point more or less straight to a point; with a tracker ball you have to roll a marker round until you find the point you want. It is considerably slower than using a direct light pen. I do not think anybody really knows the answer to the question about fatigue with light pens.

Mr Tobias: Would the justification on the CRT face slow down the display considerably? You have said we want to speed up the display to get flicker rates higher, but if you start justifying texts on the screen this involves restarting the text every space.

Mr Pegram: This is true. The display is maintained by a backing store which is completely independent of the computer. Therefore the justification is essentially an operation which goes on inside the computer. It modifies the display, which means that if the justification is done in one step the whole display changes in one cycle, and that is it.

Mr Tobias: Supposing the justification were done by hardware rather than software?

Mr Pegram: I do not think we have really considered doing it by hardware. Most of the problems of editing are essentially software problems and the approach we are taking is to simplify the hardware as much as possible to get costs down, to get reliability and to put all the sophistication into software. This is particularly true of the light pen which has a very comprehensive program to drive it.

Mr Tobias: In the case of text editing, if you are only using it to indicate positions, this is quite easy because you are outputting one by one. If you get an interrupt at the time you are outputting, you have usually got the co-ordinates of that character straight-away.

Mr Pegram: I should have qualified what I said. This application is only one of many we are looking at, and by using a simple light pen in a complex programming system this meets our requirements more fully than in the reverse case. But for a particular instance, like text editing, you may be right. This is a problem which can only be solved by long usage. This is the whole problem with sophisticated displays; they have not been in operation long enough to get the answers to lots of questions.

Mr Wiseman: I should contest the view that the light pen involves a great overhead in software. I think that, in many

respects, it is a great deal easier to use a light pen than it is to use a thing like a tracker ball, or a joystick because it does work with the light from the tube. When the light pen 'speaks' to you you know it 'saw' something which is part of the picture, whereas if you have to use a tracker ball you have to do some proximity test with the place where the tracker ball says it is, or you have to increase the hardware complexity, in order to do equivalence between the tracker ball and what the screen is doing.

Mr Pegram: I agree. I do not think the tracker ball or joystick will ever be used in this field.

Mr Wiseman: You were saying it was an easy thing to program for compared with the light pen, which is difficult.

Mr Pegram: It is an impression I would not want to give because I agree entirely on this particular point.

Mr Holroyd: May I ask Mr Pegram, what the manufacturer's approach is in putting sophistication into the software? To sell to the customer the hardware and let the customer sort his own problems out, or sell the software and the hardware as a package deal?

Mr Pegram: We would try to sell you a complete service, but we can do your programming for you.

Mr Newman: Surely, if you make the software complicated you are going to put the price up? You have got to pay for the software as well as hardware.

Mr Cowan: Hardware costs are pure equipment. Once you have done the software it is complete.

Mr Pegram: If you buy a system you want to change in two or three years' time, you can change software, and it will be cheaper than changing hardware.

Mr Cowan: The point was raised of the need for high light intensities. I wonder how important this is to book correction and editing where, if the device is in a special room, it does not have to undergo ambient office lighting conditions. I understand this would be necessary in an on-line system where you use the typewriter as a feedback. But for book correction I wonder if this is such a serious matter.

Mr Pegram: We have recently looked at a lot of systems for displays in all sorts of industrial environments, and in every case, regardless of whether or not it is practical to have darkened display rooms, customers always want display rooms with ordinary office lighting, not subdued or special colour lighting. So we must have bright displays.

Mr Cowan: Why do you think this is so, because it is common to have radar installations in a darkened room?

Mr Pegram: It was; it is becoming increasingly more common to have bright radar displays.

Mr Jones: The operator not only has to edit the text on the display tube but must also carry out other duties for which he uses office lighting. You have problems of adjustment from one grade of lighting to another. There must be some correlation between these two.

Mr Holroyd: Displays are usually white on black. Has anybody had a go at doing it the other way round?

Mr Jones: Television does it this way.

Mr Holroyd: But television does not give graphic quality.

Mr Cowan: It does if the character is big enough.

Mr Jones: There appear to be as many preferences as there are people for colour and colour practices. Our preference is for green.

Dr Margerison: The Ferranti orange display, is, I think, by far the best that I have seen from the point of view of looking at it, and certainly very much better than the green displays. I am sure green is a very trying colour on the eyes if you are watching it closely.

Mr Pickering: From the educational psychologist's point of view much has been done on the basis of blackboards and chalk, and it was found that yellow on a green board improves visibility. Could you do something like this?

Mr Cowan: Displays used at Elliott's tend to have yellowish filters placed in front of them. This is considered by people developing these systems as the best colour. It seems that everyone likes a different colour.

Mr Pegram: At the moment we do not have any choice of colour.

The Moderator: This is a vital point because everything we are discussing is going to stand or fall by whether a man can sit in front of the display for a long period of time and perform accurate work.

Mr Baconnet: There are a lot of people looking at green screens and controlling aircraft navigation, and the aeroplanes seem to be landing safely. They are on duty for six hours.

The Moderator: But not with displays of 4,000 characters. We are talking about very big displays.

Mr Baconnet: The concentration required from these people is high, too, because an aeroplane deals with people, not characters.

Mr Robinson: They are not watching that full time, are they?

Mr Baconnet: Almost. I am speaking of London Airport, and Paris is the same; I have seen the Paris one.

Mr Robinson: I do not think they continually watch the screen.

Mr Cowan: Perhaps the other problem is that here you are transferring your attention, alternating from printed copy to screen.

Mr Kingsman: If the display unit does not give a facsimile of the printed word—in other words unless it is going to show the typeface, the size, the justification, the hyphenation—what value is it going to be to the reader?

The Moderator: In this context by reader you mean the display or computer operator. This is what Mr Holroyd and Mr Cowan were talking about. It would be very nice if we could display all these things, and potentially they all *can* be displayed, but to do so would mean that the cost of the system goes up and up. So, as an interim measure, what is suggested is a facsimile proof, from a photo typesetting machine if you like, which is read in the normal way. The operator has this on one side of him so that it is only necessary to display on the screen the upper and lower case characters and punctuation marks—in other words *positional* information and not really typographic information.

Mr Wiseman: If you are reading the text in order to edit it the information you want is not the information which appears on the eventual printed page, it is information about the holes in the paper tape (if paper tape is your product) which goes to the photo typesetter because everything that can be punched must be editable. The tape might be wrong and you must be able to take things out and put things in. A particular command to a photo typesetter might not produce an image, but it must at the time you are editing because you might want to delete or modify that function. So you must expect, while you are editing, for there to be a lot of things on the screen which are not in the text, but are commands to the photo typesetter.

A scope text editing program: N. E. Wiseman.

Mr Phillips: What language is Mr Wiseman's editing program written in?

Mr Wiseman: It is written in machine code for PDP-7.

Mr Cowan: Is there any evaluation of the time-saving on program editing using this system compared with conventional methods? He said he is actually using it for real program editing.

Mr Wiseman: It has been used for program editing. I do not know how much time is saved, but the fact that people use it is an indication that they save something.

Mr Emery: All our speakers this morning on using these light pens for editing have indicated that we will work from a proof. Where do they suggest we get the proof?

Mr Tobias: We are only suggesting you use a proof when there is a high-speed photo typesetter available.

Mr Emery: Having said that, you have deflated the value of your editing system, because we have now got to pass through the photo typesetting machine and set the job once. You will then produce a completely new edited, updated tape and we will set the whole job again. This is what we have got to avoid.

Mr Tobias: The alternative is to cut correction lines in (which is a messy business and probably does not really produce the high quality you would require) or produce a completely new tape and re-run it. You are still going to have more than one process unless you do proof reading on the display, which we do not think is really possible at this stage.

Mr Emery: Would it not be possible to get a printout by some means from the non-justified tape which we could use for editing purposes without having to involve our relatively expensive photo typesetting machine? If we are using hot metal we can already edit by tape merging and produce a 'correction-only' tape, because it is a fairly simple matter to change lines in the galley in the conventional way, only resetting those lines which bring the original setting up to the required standard. In photo typesetting, if you did this, you would have to strip in correction lines, but I think we must avoid making two passes through a pretty expensive photo machine.

Mr Lambeth: On this question of proofing, there has to be a compromise. If people want to have a proof on which they can correct every single detail there is very little alternative to that of going through the whole process. If you want a proof at an earlier stage, unless you are going to involve expensive machinery, you have got to go to something cheaper and simpler where you read the typographical details. If you want proofs on cheaper or faster machinery you will have to sacrifice something from the typographic angle. Either you will get your style changes by cryptics in the text or, let us say, from a typewriter. This is a point where there has got to be some degree of compromise. You cannot have it both ways.

Mr Phillips: May I augment that by asking Mr Wiseman or Mr Tobias whether they think they can show some typographical style by their character generation? I noticed Mr Wiseman was using lower case. Would he tell us what sort of styles he thinks he can get either from dot or line generation so this can be recognised on CRT?

Mr Wiseman: A paper is being given at this Conference by Mr Wakefield on this very thing, and he has experimented with our computer with one or two different typefaces. It would not be reasonable to put these into the existing system, because the display is not fast enough, and to incorporate the extra detail would make it flicker even more than it does. Flicker is pretty intolerable now.

Mr Phillips: What I am concerned about is this whole approach. I have drawn the line by saying that any photo typesetter which throws a character grid of some sort about is not likely to exceed 40 characters a second. I do not say fast photo typesetters *start* at 40 characters a second, because this is not fast enough to give you an economic proofing mode. You have to start on your economical proofing mode at something like 150 characters a second, and from there on it does not become an expensive

process; it becomes the process you use instead of the line printer or any other proof device, and you get perfect typographic form even though you may not have justification. Then you can edit via a CRT and go back to your photo typesetter with an edited input for justification.

The Moderator: We seem to be discussing whether a proof is an expensive luxury or not, and maybe as far as an editing on the display operation is concerned you could say it would be. But we undoubtedly require proofs for so many other purposes.

Mr Jones: May I comment on the character font? We, as a company, do not recognise any great problem in producing any character font within the limitations of the size of the character on the screen. What is a much more difficult problem is the registration of the characters' spacing side by side, and registration on a horizontal line. This, as far as we are concerned, is a much more intractable problem. Character definition is not a limitation as far as we are concerned.

Mr Phillips: A person who is going to read the proof should not be worried about bad spacing, within limits, and bad alignment, within limits, but should be concerned about recognition of whether it is intended to be in bold face or italics in relation to roman. He can see it is meant to be like that and that it is set in the right typographical form. The fact that it is a bit uneven should not worry him unduly if he knows that in the final print-up it will be perfectly all right.